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Improved Aodv (I-Aodv) for Ensuring Reliable Medical Data Routing in Wban Network

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Abstract: ***Healthcare application of wireless sensor network has seen tremendous boost in recent times because of wearable devices. In such scenarios, the routing has to be done effectively and securely.In such networks the packet delivery and E2E delay are of prime importance. The proposed scheme modifies the selection of the optimized path using AODV routing protocol by considering the fitness value of the nodes in the possible paths. The optimized path is the one that has nodes with highest remaining energy and highest packet delivery ratio. The proposed and the existing schemes were implemented in network simulator 2.35 and the performance parameters were throughput, packet delivery ratio and end to end delay. These parameters showed an improved over the existing scheme.***

Keywords: Adhoc network, congestion, PDR, Throughput and AODV.

I. INTRODUCTION

Current study of WSN [1] exposed that efficiency of energy have been greatly based on a sensor node power consumption technique [1].Remote patient monitoring and rehabilitation are the few of the many applications of WBAN [2]. Wireless body area network architecture for applications of healthcare are mostly use in controlling patient tasks. In this form of network, the sensors may recognize on the body of human measure diverse body parameter, that signify the major usually deployed resolution within this area. Sensors over the bodies with wireless abilities are of great concern to this form of Wireless Body Area Network, As they give an easy and also accessible method to control the health position of patients over extended periods of time, passes the employment of cables wired around the patient. Basic hobbies for example running and walking and physiological actions such as the heartbeat and breathing influences the wireless propagation thoroughly [3]. The routing protocol is required for bringing the path resulting process is usually AODV.AODV is an development protocol of Destination Sequenced Distance-Vector routing protocol [4].

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The study is aimed at optimizing the performance of the network work which is deployed in the hospital scenario. AODV protocol chooses the shortest path in terms of number of hops which may not be the optimal path. The proposed scheme however modified the selection of the optimized path by considering the fitness value of the nodes in the possible paths. Section II of this paper describes the related studies and section III explains the proposed protocol. Results have been explain in Section IV and finally paper has been concluded in the last sector of this paper.

II. LITERATURE SURVEY

The presented paper [5] assesses and analyzes the execution of routing protocols in Wireless Ad Hoc Mode of network and also talks about utilization of ad hoc wireless local area network in provision of urgent health issues for a clinic. The crucial information of bodies inside a clinic are checked and imparted further to specialists inside the emergency clinic. The outlined situation is used in dealing with several crisis circumstance, as it were, and diminishes the hold which is usually vital for urgent cases . In the proposed examination, the specialists and the bodies are thought to be versatile to imitate the genuine circumstance. Nevertheless, the development of the bodies and specialists are bound to a restricted variety.

In this paper [6], the authors have attempted to control the vulnerabilities issues because of dynamic network topology and constrained resources in request to conserve the network assets utilizing fuzzy logic tool. Since the network performance measurements, for example, delay, data transmission and energy changes all around much of the time because of node mobility, for example, these system measurements include the vulnerability cases in a wireless mobile ad-hoc network. Main effect of this vulnerability case makes an issue in the choice of ideal way from source node to a gathering of sink nodes. Here, mechanism all of the accessible system measurements of the courses is changed over into a solitary metric for example, fuzzy cost or cost of communication . The routes which have least fuzzy cost are measured as ideal way also the data is to be transferred in this way from source node to receiver nodes . The model has been directed utilizing MATLAB and NS-2 , the outcomes demonstrates the viability of the outlined protocol (EFMMRP) over ODMRP and MAODV on basis of packet delivery ratio, packet delivery delay PDD and control overhead.

In this paper [7], the authors have outlined a system for communication of post-disaster utilizing wireless ad hoc networks. structure incorporates: (i) a multi-channel MAC protocol to develop the system throughput, (ii) an energy aware multi-way routing for prevailing over the advance energy exhaustion nodes rate connected with particular shortest path routing (iii) an appropriated model attentive plan for limiting the transfer . over all these concepts mentioned above , put all together expect to expand the system throughput, decrease the end-to-end delay, and upgrade the system lifecycle of an ad hoc network used for disaster results . A multi-channel MAC protocol allows the transfer from covered and also uncovered nodes with no interference with the available transmission. They contrasted the outlined system with an accessible method known as Distress net. Working results demonstrate that the presented scheme results more lower end-to-end delay, throughput, and an extend system life span.

This paper[8] builds up a disseminated calculation for building up an energy-aware stamina for martial ad hoc network made out of numerous sections , to be specific E2CLB. The calculation depends on ideas of associated sets of powerful and furthermore on node centrality ideas, and outcomes a guideline answer for issue of conveying a most extreme power , least associated influencing set for a network of multilayer by involving into the influencing set those sensor nodes which are greatly linked to their and some other layers (which means that they have more centrality value) and further they are wealthy in energy . The calculation and interaction issues of the model are well studied , and an intensive simulation dependent assessment of it against six rivals is proposed . The outcomes demonstrate that E2CLB is either the optimal performing model across the analyzed execution actions or it can exchange a little increment in the mass of the network backbone's in sequence to gather enhanced presentation in the area of energy .

The authors in [9] analyzes efficient of energy broadcasting in wireless networks of unknown topology (*ad hoc*). They evaluate energy ability by the best number of transfers ('shots') permitted to random node in the network. Specifically, the authors look at the issue in which a bound *k* is taken and a node may transfer at most *k* times during the broadcasting protocol. At first, they center around neglectful model for *k*-shot broadcasting, that is, calculations where at each progression every node chooses whether to transfer or not with no thought of the transmission background . The major donation are (a) a lower bound of $\Omega(n^2/k)$ on the time of broadcasting of any usual *k*-shot broadcasting algorithm, and (b) an oblivious broadcasting protocol that accomplishes a matching upper bound, namely $O(n^2/k)$, for every $k \leq n^{1/2}$ and an upper bound of $O(n^{3/2})$ for every $k > n^{1/2}$.They additionally think about the general instance of adaptive broadcasting protocols where nodes choose whether to transmit dependent on all the accessible data, in particular the transmission history known to each. The creators demonstrate a lower bound of $\Omega(n^{1+k/k})$ on the broadcasting time of any protocol by introducing the transmission tree construction which generalizes previous approaches.

In this paper [10], the objective is to limitthe intrusion rather than ensuring the end-to-end delay under a constraint. The authors consider 3 main objectives of optimization , counting the most extreme interference, average interference and average path interference. They present a centralized model with a greedy concept that can limit greatest intrusion while fulfilling the delay restriction. A distributed algorithm (LDMST) is presented to limit the average interference. In LDMST, each node assembles a delay-constrained least spreading over tree (DMST). To limit the path interference, a confined delay-constrained Bellman–Ford (LDBF) algorithm is proposed. LDBF utilize an advanced Bellman–Ford algorithm to locate ideal path, which has the minimum interference and fulfills the constraint of delay . The last model is made up of these ideal ways. The results of simulation present that the proposed topology control algorithms show great execution as far as the interference objectives and can also make sure the end-to-end delay under the constraint.

The paper [11] outlines a fuzzy logic explanation for passionate changing both transferring power and resting time in an IEEE 802.11 wireless network. This paper has displayed a mechanism to powerfully direct the sleeping time and transmission power of the stations in a WLAN, so as to broaden the span of the batteries. The working of the two parameters is straightforwardly outlined by every station in an ad hoc WLAN, or it may be defined to the access point in an infrastructure WLAN. In both the cases, a combination of fuzzy logic controllers appropriately set the simulation parameters of the station by assessing its outstanding battery level, the throughput for the remaining ratio of the task and the RSSI of the transferred information. Broad simulations were outlined by ways of Simulink/ MATLAB tools in turn for finding the optimal settings for the FLCs and to contrast the presented work with other state-of-the-art approaches. The proposed methodology is assessed first by running simulations and then by realizing areal testbed. Equal assessment strategies atates that calculating the simulation parameters with the two FLCs can draw out the lifespan of battery of a station up to 50% in contrast to the evade hold with no guideline. Furthermore, a contrast test is achieved by involving two state-of-the-art models for locating sleeping time and transfer power of the stations; the outlined algorithm attains the best completion , as it extend the battery lifespan up to 40%.

III. PROPOSED METHODOLOGY

For the hospital scenario, we will consider 'N' number of patients in respective rooms in the ground level of the building. The doctor's office will be assumed to be at the starting of the corridor.

The modification to the AODV is proposed in the following way:

Any sensor node that needs to send readings of the patient's body to the doctor would broadcast the RREQ packet to the sensors in its communication range. The broadcasting will endure till the request is reached at the destination node.

Once the RREQ packet reaches the node with the doctor (referred to as destination hereby), the destination node would compute the fitness level of respective node. The fitness level will computed based on the residual energy of the node and congestion level over it.

The congestion furthermore, will be determined by the packet delivery ratio of the node. If the node has higher packet delivery rate, that means it is forwarding the packets properly and has less congestion over it.

Fitness level = a*(Remaining energy/ Initial energy) + b*PDR

Where a and b are constants.

The destination node will give a reply to the source via two paths having highest and second fitness level.

When the RREP packet reaches the source node, the source node would forward the packet to the receiver via the path having highest fitness level.

IV. RESULT

Taking required effectiveness of the routing into consideration, the proposed protocol was designed and simulated in network simulator. The existing protocol was also implemented in network simulator. The various parameters used for simulation in our work are:

Parameter	Value
Channel	Wireless
Mac	802.11
Antenna	Omni Directional
Type of Propagation	Two Ray Ground
Queue	Drop Tail
Queue Length	50
Number of nodes	28
Routing protocol	AODV
Network Area	1000*400 sq meters
Initial Energy	50 Joules

Table 4.1: Simulation Parametes

The parameters used to examine thework of the network were throughput, packet delivery ratio and end to end delay.

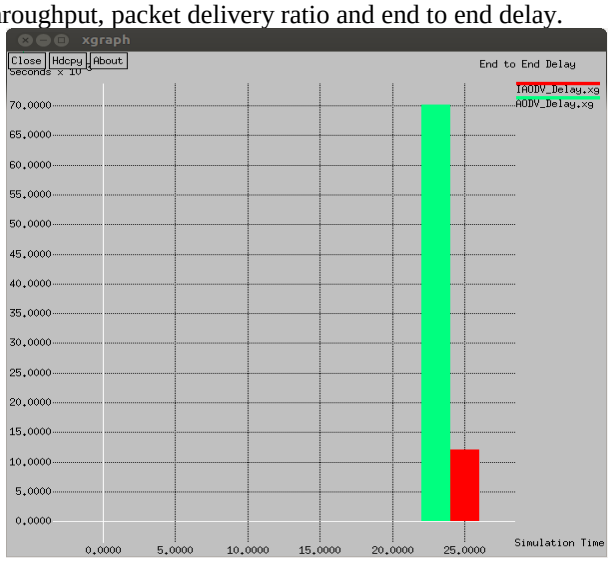

Figure 4.1: Delay Comparison

This figure shows the delay values that was computed after using both the schemes. The value for delay for the improved AODV was found to be 0.012 seconds and for the simple AODV was 0.070 seconds.

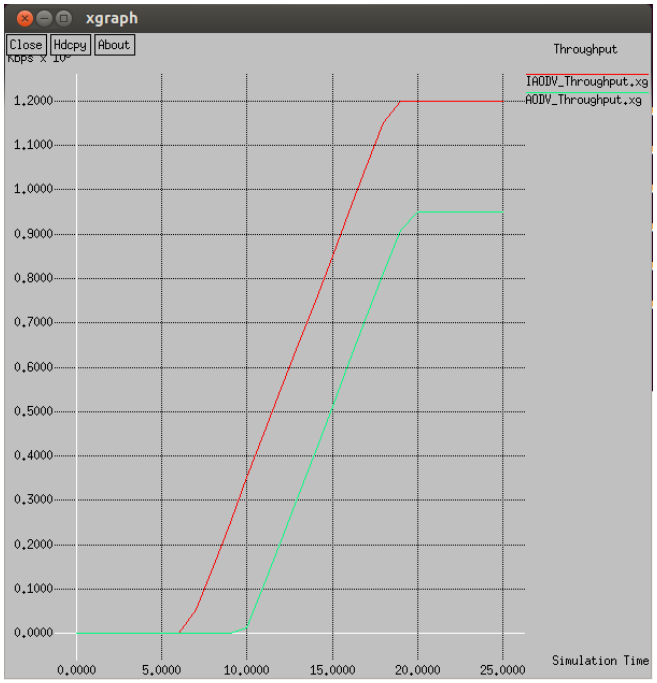

Figure 4.2: Throughput comparison

This figure represents the throughput values gained in the network. The value of throughput for the improved AODV was 1200 Kbps and 950 Kbps for the presented algorithm. Because the route reply reaches the source node earlier in the network while using the improved AODV and the data is also sent over the optimized path having nodes with higher remaining energy and higher packet delivery ratio.

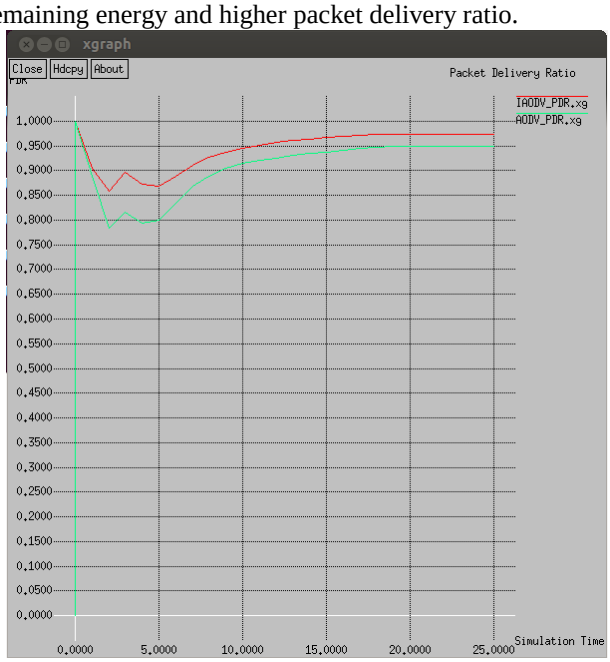

Figure 4.3: PDR Comparison

The figure represents the values packet delivery ratio attained in network. The value for the improved AODV was 0.973 and 0.949 for the existing scheme. This is because the data transmitted is over the path having higher packet delivery ratio which provides better data delivery.

V. CONCLUSION

The proposed scheme aims at improving the performance of the network which is deployed in the hospital scenario. In such networks the packet delivery and E2E delay are of prime importance. The proposed scheme modified the selection of the optimized path by considering the fitness value of the nodes in the possible paths. The optimized path is the one that has nodes with highest remaining energy and highest packet delivery ratio. This leads to better PDR for the presented work when the data is sent from patient to doctor. The higher value of PDR also leads to better throughput. The value of throughput for the proposed is found to be 1200 Kbps and for the existing scheme the value is 950 Kbps. Furthermore in this presented work , the reply phase from the route is executed over two paths only. The optimized path in this paper has least congestion over it since the nodes have higher packet delivery ratio. This reduces the delay for the proposed scheme which is 0.012 seconds and 0.070 seconds for the existing scheme.

Security is also equally important for healthcare applications. Many attacks such as black hole attack or packet manipulation charges can happen in such networks which can convey wrong information to the doctors. Thus, in future the proposed approach can be made more secure for better performance of the network.

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Girija Goswami is working as a student in Computer Science Engineering Dept. in Yagyavalkya Institute of Technology Jaipur, Rajasthan, India. Girija Goswami is pursuing M.Tech. from 2013 in Department of Computer Science Engineering. She received her B. Tech in Computer Engineering from Yagyavalkya Institute of Technology, Jaipur affiliated to Rajasthan Technical University; Kota, Rajasthan, India in 2009-2013.Her area of interest includes routing protocol, computer networks, mobile computing and php language. In B. Tech her dissertation topic was Online Shopping using php lang.She is also interested in surfing and browsing net to research about new softwares, applications and websites.

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